

What is Claimed:

1 1. A method for transmitting a data stream that exhibits long-range
2 dependence through a digital communication network, comprising the steps of:

3 (a) receiving a plurality of blocks in the data stream, each block
4 including a plurality of data values;

5 (b) reordering the blocks according to a predetermined deterministic
6 scheme to reduce the long-range dependence of the data stream;

7 (c) transmitting the reordered blocks through the digital
8 communications network to a receiving node; and

9 (d) reordering the blocks again, at the receiving node, to reverse the
10 predetermined deterministic scheme and regenerate the data stream.

1 2. A method according to claim 1, wherein the predetermined
2 deterministic scheme reorders a predetermined number of blocks, N_{MB} corresponding
3 to a macro-block, the predetermined number being defined as $N_{MB} = S (R+1)$ where
4 S is an integer skip number defining a number of input blocks that are skipped
5 between successive blocks of the reordered data starting from block D in the macro-
6 block and R is an integer restart number defining a number of skip operations to be
7 performed before restarting the skip operations from block D+1 in the macro-block,
8 where D is an integer.

1 3. A method according to claim 2, wherein S is equal to R.

1 4. A method according to claim 2, wherein S and R are greater than
2 32.

1 5. A method according to claim 2, wherein:

2 the data stream is an variable bit rate (VBR) video stream including a
3 plurality of picture records;

step (b) includes the steps of:

identifying the picture records in the VBR video stream; and

reordering the picture records according to the predetermined deterministic scheme; and

step (d) includes the steps of

identifying the picture records in the reordered VBR video stream;

and

reordering the picture records again to reverse the predetermined deterministic scheme and regenerate the VBR video stream.

6. A method according to claim 1, wherein the blocks of data are grouped in macro-blocks and the predetermined deterministic scheme is applied to all of the blocks in each macro-block individually.

7. A method according to claim 6, further including the step of reordering the macro-blocks prior to applying the predetermined deterministic scheme to a macro-block and wherein the step of reordering the blocks at the receiving node further includes the step of reordering the macro-blocks.

8. A data transmission interface for a digital communications network which transmits data from an input node to an output node, a portion of said data exhibiting a long-range dependence, comprising:

means for receiving blocks of data to be transmitted through the network, each block including a plurality of data values;

a shuffling buffer which reorders blocks of the received data according to a predetermined deterministic scheme reduce the long-range dependence of the data and to provide the reordered blocks of data to the input node of the network; and

a reconstruction buffer, coupled to receive the reordered data from the output node of the digital communications network, the reconstruction buffer reordering the data to reverse the predetermined deterministic scheme and reconstruct the received data.

9. A data transmission interface according to claim 8, wherein the shuffling buffer includes:

a skip register which holds an integer skip value, S; and

a restart register which holds an integer restart value, R;

wherein the predetermined deterministic scheme reorders a predetermined number of blocks, N_{MB} corresponding to a macro-block, the predetermined number being defined as $N_{MB} = S (R + 1)$ where S is an integer skip number defining a number of input blocks that are skipped between successive blocks of the reordered data starting from block D in the macro-block and R is an integer restart number defining a number of skip operations to be performed before restarting the skip operations from block D + 1 in the macro-block, where D is an integer.

10. The digital communications network of claim 8, further comprising a plurality of transmission nodes in the data communications network, each transmission node having a queuing buffer, wherein each queuing buffer has a predetermined memory size sufficient only to queue data that does not exhibit long-range dependence through the network.

11. A data transmission interface method which configures data exhibiting long-range dependence for transmission through a digital communications network from an input node to an output node of the network, the method comprising the steps of:

receiving blocks of data to be transmitted through the network, each block including a plurality of data values;

7 reordering the received blocks data according to a predetermined
8 deterministic scheme reduce the long-range dependence of the data;

9 providing the reordered blocks of data to the input node of the network;
10 and

11 retrieving the reordered blocks of data from the output node of the
12 network; and

13 reordering the data to reverse the predetermined deterministic scheme and
14 reconstruct the received data.

1 12. A computer readable carrier including computer program
2 instructions that control first and second computers coupled, respectively, to an input
3 node and an output node of a digital communications network, the computer program
4 instructions implementing a method that formats data which exhibits long-range
5 dependence for transmission through the digital communications network, the method
6 comprising the steps of:

7 receiving blocks of data to be transmitted through the network at the first
8 computer, each block including a plurality of data values;

9 reordering the received blocks data according to a predetermined
10 deterministic scheme at the first computer to reduce the long-range dependence of the
11 data;

12 providing the reordered blocks of data to the input node of the network;

13 retrieving the reordered blocks of data from the output node of the
14 network at the second computer; and

15 reordering the data, at the second computer, to reverse the predetermined
16 deterministic scheme and reconstruct the received data.

1 13. A computer readable carrier including computer program
2 instructions adapted to instruct a general purpose computer to implement a method that
3 substantially eliminates long-range dependence of data using a scheduling method, the
4 method comprising the steps of:

5 (a) receiving a plurality of blocks of data, each block having a
6 predetermined block size; and

7 (b) reordering the blocks of data according to a predetermined
8 deterministic scheme to substantially eliminate the long-range dependence of the blocks
9 of data.

1 14. A computer readable carrier including computer program
2 instructions adapted to instruct a general purpose computer to implement a method that
3 reformats data that has been formatted to substantially eliminate long-range dependence,
4 the method comprising the steps of:

5 (a) receiving a plurality of blocks of data, each block having a
6 predetermined block size, wherein the blocks have been reordered according to a
7 predetermined deterministic scheme; and

8 (b) reordering the blocks of data to reverse the predetermined
9 deterministic scheme to restore an original order to the blocks of data.